30,32. The container 18 further includes one or more features operable to enable the analysis of the biologic fluid. At least one of the features is spatially located within the chamber 20 at a known spatial location. Features may include physical characteristics (e.g., a particular through-plane thickness at a known spatial location), geometric characteristics (e.g., an object of known volume located at a known spatial location), reagents disposed within the reservoir 22, or a colorant calibration pad 34, etc. The container label 28 stores information that is communicated to the apparatus 10 through a label reader 38 (FIG.4).

I. The Reader Module

Referring to FIGS. 4 and 5, the Reader Module 12 includes the aforementioned label reader 38, a field illuminator 40, means for determining the volume of a field of the sample, and an image dissector 42. The container label reader 38 is a mechanism for transferring information from the container 18 to the apparatus 10. A practical example of a container label 28 is one which is machine readable and one which is capable of communicating information including, but not limited to: 1) the type of analysis(es) to be performed; 2) information concerning the type of features, and the coordinate addresses of those features located within the sample chamber 20; 3) reagent information; 4) lot information; 5) calibration data; etc. If, for example, the label 28 is a magnetic strip or a bar code strip, then the label reader 38 is a device capable of reading the magnetic strip, the bar code strip, etc. In some instances, it may be possible to store and extract all of the necessary information from the label 28 itself. In other instances where the quantity of information to be communicated is considerable, however, it may be more practical to have the label 28 direct the apparatus 10 to a data file stored within the Programmable Analyzer 16 or stored remotely that contains all the appropriate information. Remotely stored data files can be accessed via modem, dedicated telecommunications line, the internet, wide area network, or other telecommunication means. The label 28 may also be a physical feature such as a tab whose position is interpretable by the label reader 38; e.g., different tab positions relate to different data files.

The field illuminator 40 includes a light source 44, objective optics 46, and preferably a light filtering means 48. The light source 44 selectively produces light throughout a wavelength range broad enough to be useful for a plurality of analyses (e.g., approximately 340nm to 670nm), from a mechanism such as a fifty watt zenon arc lamp or tungsten halogen lamp, or a pulsatile source of about ten joules. Other light sources may be used alternatively and the wavelength range of the light source may vary depending upon the application. Alternatively, a light source 44 which selectively produces particular wavelengths of light within the above identified range, or a plurality of light sources 44 each of which produces particular wavelengths within the above identified range, may be used. The objective optics 46 include a focusing mechanism 50 for adjusting the position of an objective lens 52 relative to the container 18 (or vice versa). The objective lens 52 focuses light emanating from the light source 44 into a light beam 54 which, in turn, is directed into the sample quiescently residing within the chamber 20. The light beam directed into the sample is of sufficient area to illuminate at least one imaged field of the sample. The sample field is defined by the cross-sectional area of the sample image which impinges on the image dissector 42, or a portion thereof, as directed by the objective optics 46 and any intervening field stops. The light filtering means 48, when included, is used to improve the quality and/or clarity of the desired sample image for a given test or to allow a precise quantitative measurement of light energy emitted from, or passing through, relevant portions of the sample. If the light source 44 is capable of selectively producing particular wavelengths, it may be possible to omit the light filtering means 48.

The preferred embodiment of the field illuminator 40 varies depend upon the principle used to produce the image. Referring to FIG.4, a first embodiment of the field illuminator 40 utilizes fluorescence to produce an image. The first embodiment includes a flash tube type light source 44, optics 46, and a light filtering means 48, the latter of two which include a first lens 56, a light source excitation filter 58 ("LSE" filter), a light diverting prism 60, a reference detector 62, an objective lens 52, a sample emission filter 66 ("SE" filter), a second lens 67,

and a focusing mechanism 50. The light diverting prism 60 may be a polarizing prism, a dichroic beam splitter, or a half-silvered mirror or prism. The first lens 56 collects light emanating from the flash tube, or alternate source of illumination, and directs it through the LSE filter 58. The LSE filter 58 allows light of a predetermined wavelength(s) to pass through (this function can also be described as blocking all but predetermined wavelengths from passing through) and continue on where it strikes the light diverting prism 60. A portion of the light then passes through the light diverting prism 60 and strikes the reference detector 62 positioned adjacent the light diverting prism 60. Feedback from the reference detector 62 allows the filtered excitation light energy to be measured. Since fluorescence emission is directly proportional to the energy of the fluorescence excitation, any variations in the excitation light energy, as measured by the reference detector 62, can be used to either adjust the intensity of the emission source or to calculate a corrected emission energy. Another portion of the light entering the light diverting prism 60 is reflected approximately ninety (90) degrees downward through the objective lens 52 and subsequently into the container chamber 20 where the biologic fluid sample quiescently resides. The objective lens 52 is attached to the focusing mechanism 50 that enables the distance between the objective lens 52 and the chamber 20 to be varied as necessary for focusing purposes. A controllable stepper motor arranged to change the focal distance between the objective lens 52 and the container 18 is an example of a focusing mechanism 50. Typically, the objective lens 52 is moved relative to the container 18, or vice versa, but alternative methods may be used. The wavelengths of light passing through the LSE filter 58 and the objective lens 52 subsequently enter the sample, causing material within the sample bearing a chosen colorant to fluoresce and emit light of a particular wavelength. That emitted light passes back through the objective lens 52, through the light diverting prism 60, and then through the SE filter 66. The SE filter 66 blocks all but (or passes) select wavelengths of light. Those wavelengths of light subsequently pass through the second lens 67 and encounter the image dissector 42. The SE filter 66 is preferably a tunable liquid crystal display (LCD) filter.